Architecture for Navigation and Communication Receivers (ANCR)

Completed Technology Project (2015 - 2016)

Project Introduction

With the decreased size and power of electronics, efforts are being made to merge the core spacecraft electronics into a single processing platform to reduce size, weight, and power (SWaP). There is a particular desire to integrate spacecraft communication and navigation systems in order to improve the performance of both receivers, support autonomous on-board navigation, and enhance user operations. The goal of this project is to develop a multipurpose, flexible, scalable receiver architecture for Field-Programmable Gate Arrays (FPGAs) that can acquire and track communication and navigation signals.

Due to the growing availability of highly capable, radiation tolerant Field Programmable Gate Arrays (FPGAs), modern satellite hardware platforms are starting to incorporate them into their designs. Hardware developers are taking advantage of the high number of logic resources within these chips to implement and integrate a lot of the software and signal processing functions required by missions.

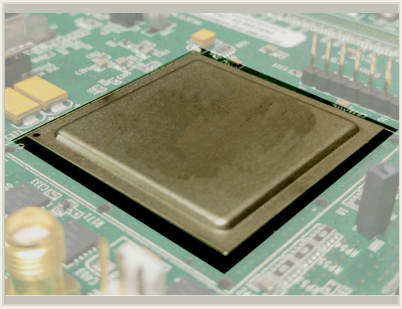
This project proposes to develop a generalized FPGA-based receiver architecture for receiving spacecraft communication and navigation signals.

The key benefits of this novel architecture are that it would:

- simplify the integration of the communication and navigation functions of a spacecraft,
- reduce receiver development time for new types of signals or hardware plaforms, and
- address the on-board navigation and communication needs for a wide variety of mission types from CubeSats to large "flagship" science missions.

Anticipated Benefits

Tracking and Datay Relay Satellite System (TDRSS) Augmented Signal System (TASS) Demonstration on STP-H6 payload



Field Programmable Gate Array

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Organizational Responsibility

Responsible Mission Directorate:

Mission Support Directorate (MSD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Center Independent Research & Development: GSFC IRAD

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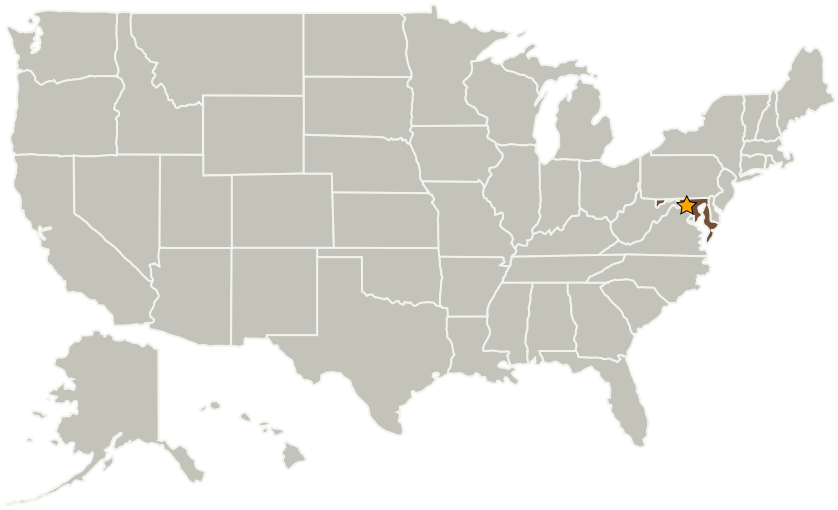
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations
Maryland

Project Management

Program Manager:

Peter M Hughes

Project Manager:

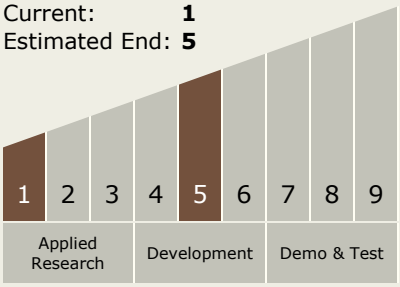
Dennis W Woodfork

Principal Investigator:

Luke J Thomas

Technology Maturity (TRL)

Start: **1**
Current: **1**
Estimated End: **5**

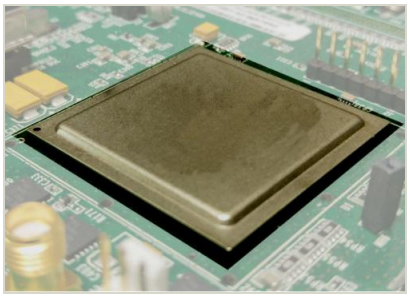


Technology Areas

Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
  - TX05.2 Radio Frequency
    - TX05.2.4 Flight and Ground Systems

Images



Field Programmable Gate Array
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(https://techport.nasa.gov/image/19072)